

WALKING INTO A PROTEIN MOLECULE TOGETHER: UNIVERSITY STUDENTS' EXPLORATION OF AN ENZYME-SUBSTRATE INTERACTION IN IMMERSIVE VIRTUAL REALITY

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Immersive virtual reality (IVR) is an advanced and interactive 3D visualisation platform which can help learners to build better understanding of molecular structures and interactions. This study investigated how one of the IVR applications developed by our research team helped students to advance their conceptual understanding of an enzyme-substrate interaction. Sixty-six first- and second-year university students were paired to participate in collaborative learning tasks in IVR. Student-generated diagrams, videos of VR sessions and pre- and post-interviews were analysed to evaluate students' conceptual development. Initially, using diagrams, students described enzyme reactions in terms of a simple two-dimensional lock-and-key model. During the IVR sessions, students held extensive discussions with their partners regarding the 3D enzyme structure and circled around in the virtual space to explore the structure and electron density of the catalytic chamber. Embodied actions such as pulling the substrate into the catalytic chamber helped students to appreciate the importance of molecular shape in catalytic reactions. In the post-interviews, students discussed the bulkiness of the enzyme, its structural specificity, as well as the reasons for its high catalytic efficiency. Our findings suggest that interactive and collaborative IVR helped students visualise and gain a deep understanding of this complex enzyme-substrate molecular interaction.